Space Weather Forecast

Issued on Saturday, 02 December 2023 at 13:22 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Quiet to unsettled conditions for the rest of Day 1 (2 Dec) and through Day 2 (3 Dec), increasing from day 3 (4 Dec). Chance of M-Class flares (R1-R2 Blackouts).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity is at Moderate levels with the largest flare of the previous 24 hours a Moderate fare at 012120 UTC from a large region in the southwest disk. There are currently seven sunspot regions on the visible disc. A complex region in the SW remains the largest and most significant region, however has shown recent signs of stabilisation and was responsible for the aforementioned moderate flare. The remaining regions on the visible disc are all relatively simple.

There are a large number of filaments on the Earth-facing disc. A filament lift off in the SE disk was observed around 01/1400 UTC, the resulting CME is not expected to be Earth directed. A CME signature was observed in association with the most recent M1.0 flare from AR3500, after initial analysis this currently looks to pass ahead of earths orbit on Day 4 (05th November), although is under re-analysis for possible risk of a glancing blow. Other CME signatures in coronagraph imagery during the past 24 hours are considered far-sided and thus not Earth-directed.

Solar Wind / Geomagnetic Activity: Solar wind speeds began the period around 500-560 km/s (Elevated), associated with the arrival of the CME earlier on the 01 Dec, levels persisted at Elevated until around 02/0200UTC when they dropped to Slightly elevated levels, which they are currently at around 470 km/s.

The Interplanetary Magnetic Field (IMF) was Weak initially strong. Following the arrival of the second CME the CME arrival and remaining at strong levels until around 02/0400 UTC when it slowly reduced to moderate. The important north-south component of the IMF was strongly positive at first before easing to weakly or moderately negative until around 0200UTC, where it slowly turned weakly positive as the IMF underwent slow rotation at L1 within the magnetic cloud, finishing moderately positive y the end of the period. Phi angle was largely negative throughout (towards the Sun).

Resultant Geomagnetic activity was initially G3/Strong Storm (Kp7) levels during 01/0900-1200 UTC, with further G1-G2 Minor to Moderate Storm (Kp5-Kp6) intervals recorded 01/1200-1500, 1800-2100, 2100-2400 and 0000-0300, before falling to Quiet from 0600-0900.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) persisted at Background levels with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate with a chance of further isolated M-flares (R1-R2 Blackout),

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and a very slight chance of an isolated X-class flare (R3 Blackout). AR3500 in the southwest disc is most likely to be the source of any significant flares.

Solar Winds / Geomagnetic Activity: Geomagnetic activity and solar winds should slowly wane during the rest of Day 1 (02 Dec) as current CME influence begins to ease. Activity expected to be generally Quiet to Unsettled into day 2 (02 Dec) as winds likely return to background levels, remaining so until the arrival of the HSS Day 3 (04 Nov) associated with the large CH76/- approaching the meridian. The onset of the HSS should see winds reach Elevated to Strong levels and geomagnetic activity increase to Active to G1-G2/Minor-Moderate Storm (Kp 4-6) levels for a time. Although currently considered unlikely, the possible risk of a glancing blow of the CME from the 01 December may give a further risk of G1-G2/Minor-Moderate Storm (Kp4-6) on Day 4 (05 Dec).

Aurora: Current activity maintaining a chance of visible aurora for parts of the UK into the early part of day 1 (02 Dec). Views of the aurora as far south as Northern England and Northern Ireland are possible, with a greater chance further north where skies are clear. Further aurora activity possible into the evening of day 3 (04 Dec) with the expected arrival of faster solar winds.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to stay at background. However, any significant flares from the moderately large region in the southwest will bring a chance of flux levels increasing, with a slight chance of approaching or perhaps exceeding the S1 Minor Radiation Storm level.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	5	5	60	50
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	40	35	35
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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